PROGRESS AND PLANS

PROTOTYPE OIL SHALE LEASING PROGRAM

and

AREA OIL SHALE OFFICE

November 16, 1978

CONTENTS

Background 1

Area Oil Shale Office 2

Summary of Progress 5

Current Activities

Tract C-a 12

Tract C-b 19

Tracts U-a/U-b 26

In Situ Leasing Program 27

Work Load

Management Plan 28

Manpower 30

Coordination 31

Approvals 33

Inspections 37

Environmental Monitoring 38

Bonus Offsets and Royalty Accounting 40

Contracts 41

Outside Studies 42

Appendix

Background

Oil shale is a potential energy resource of the future. The deposits of current interest occur in the Eocene Green River Formation of Colorado, Utah, and Wyoming. It is estimated that more than two trillion barrels of oil are contained in Green River oil shale deposits which yield at least 10 gallons of shale oil per ton; of that total, more than 750 billion barrels are contained in high-grade beds that yield at least 25 gallons of shale oil per ton. Eight percent of the high-grade oil shale potential, or about 600 billion barrels, is located in the Piceance Creek Basin of Colorado.

As the Nation's supplies of conventional petroleum fuels dwindle and become costlier, development of our vast oil shale resources can provide an option needed to help stabilize the future energy situation. Many are convinced that now is the time to begin development of our oil shale at commercial levels under a carefully controlled program. Following an unsuccessful attempt to lease oil shale in 1968, the Department of Interior began efforts through the Oil Shale Task Force to create the Federal prototype program in 1971. Those efforts culminated in a six-volume Environmental Impact Statement and the sale of four leases totaling 449 million dollars in bonus bids in early 1974.

The current oil shale program is a prototype in all aspects; in regard to the mineral and its production; in regard to the type and method of regulation of public resource development; and in regard to the organization established to supervise the program. The program goals stated by the Secretary of the Interior are:

1. To provide a new source of energy to the Nation by the development of commercial oil shale technology by private industry;

2. To insure the environmental integrity of the affected areas and at the same time develop a full range of environmental safeguards and restoration techniques that will be incorporated into the planning of a mature oil shale industry, should one develop;

3. To permit an equitable return to all parties in the development of this public resource; and

4. To develop management expertise in the leasing and supervision of oil shale development in order to provide the basis for future administrative procedures.

Area Oil Shale Office

The Area Oil Shale Office (AOSO) was created in June 1974, immediately following disbanding of the Oil Shale Task Force. The office has the prime responsibility of carrying out the goals set forth by the Secretary for the Federal Prototype Leases. The organization scheme for the office recognizes that maximum participation by other agencies and the public is one of the Secretary's principal desires for the program. Attaining this participation is a tremendous task in view of the diffusion of expertise needed for the program throughout many agencies. The Area Oil Shale Office is greatly assisted in this task by the Oil Shale Environmental Advisory Panel (OSEAP) created to advise Department officials on environmental aspects of the prototype program.

A team approach with coordination on individual tract (Lease) basis using a management by objectives system was selected as the most effective administrative organization for this program (Figure 1). Personnel shown on the chart serve both in a regulatory capacity with regard to lease operations and more importantly in a coordination/liaison capacity to bring into the program the maximum amount of outside expertise. The AOSO staff comes from a variety of backgrounds and different agencies and include, in one case, a person employed by the Fish and Wildlife Service and attached to the staff by interagency agreement. To supplement the permanent staff, personnel temporarily detailed to the AOSO have been used from time to time. Also, contract assistance for specific projects continues to be used.

The specific management responsibilities of the AOSO include:

1. Supervision of lease activities in accord with the oil shale lease terms and with the applicable laws and regulations.

2. Evaluation on a continuous basis of ongoing lease programs and revision of these programs to reflect the most recent information gathered. The prototype program was based on the premise that much would be learned and that knowledge would be promptly applied. The oil shale Lease Environmental Stipulations may be revised in accordance with information gathered.

3. Collection of all data from the prototype program, analysis of the information, and documentation of the results. This is in direct response to the ultimate goal of the prototype program. To maximize the use of the vast amount of data being generated by the program, an extensive effort has been made to place relevant portions and summaries of this data into the hands of agencies with expertise in critical areas. All data from the program, including summary reports, is submitted by the lessees to the AOSO and in turn is provided to interested agencies and persons, including OSEAP. Open file copies are maintained for public inspection in the AOSO and summary reports are sent to libraries in the region.

4. Continuing development of the management structure and expertise needed to effectively supervise the current prototype program and any future oil shale leasing programs. This effort includes documentation of the procedures developed by the AOSO during the course of the program to facilitate present and future oil shale actions.

USGS - AREA OIL SHALE OFFICE
Grand Junction, Colorado
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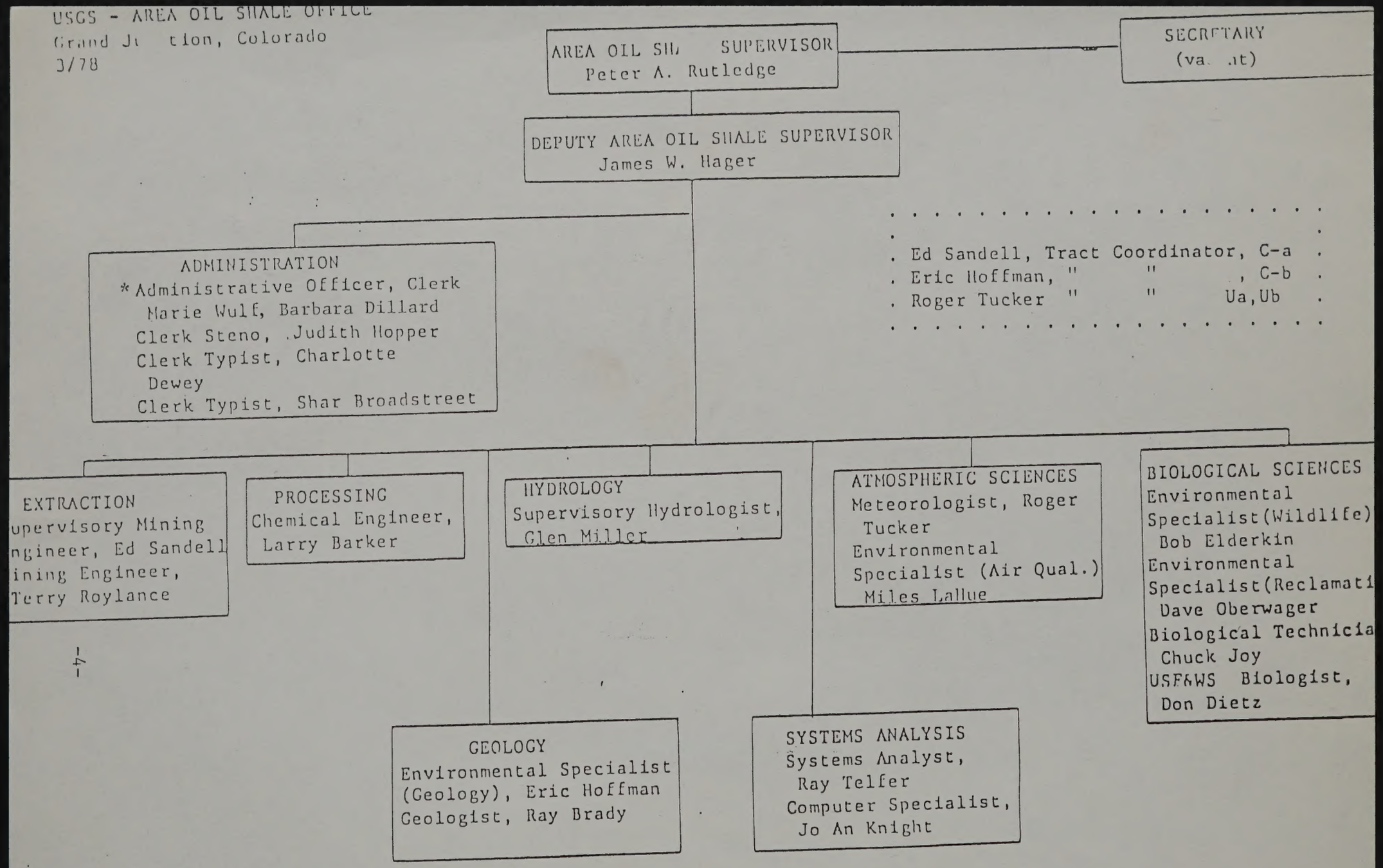


POSITIONS:
USGS 21
USFWS 1

* The Administrative Officer and Clerk work under the Regional Administrative Office for the Western Rocky Mountain Area.

FIGURE 1

Summary of Progress

June 29, 1971 ● The prototype program was announced by Secretary Morton.

- A preliminary environmental statement, program statement and state reports on oil shale were released.
- Informational corehole drilling was authorized.

November 2, 1971 ● The Department requested oil shale lease tract nominations.

- Twenty individual tracts were nominated.
- Six tracts were selected for leasing - two each in Colorado, Utah and Wyoming on April 25, 1972.

August 29, 1973 ● The final environmental statement on the prototype program was submitted to CEQ.

- Regional impacts of a one million barrel per day industry.
- Specific impacts from development of the six selected lease tracts.
- Methods of shale oil production including conventional underground and open pit mining with surface retorting, and *in situ* processing of oil shale.

January-June 1974 ● Prototype oil shale lease sales were held as follows:

Lease	Sales Date	Effective Date	Bonus Bid
C-a	1/8/74	3/1/74	$210,305,600
C-b	2/12/74	4/1/74	117,788,000
U-a	3/12/74	6/1/74	75,596,800
U-b	4/9/74	6/1/74	45,107,200
W-a	5/14/74	*	
W-b	6/11/74	*	

* The Wyoming leases received no bids primarily because of the restricted resource base.

- The bonus bids are payable in five installments, the first three have been paid, the last two may be offset by development expenditures as an incentive for prompt lease development.

February 27, 1974 ● Oil Shale Environmental Advisory Panel (OSEAP) was established and the first meeting held on April 15 of 1974. The purpose of the Panel is to:

- Continue and ensure maximum feasible public participation in the program.

- Advise Interior officials, particularly the Area Oil Shale Supervisor and BLM District Managers, on the environmental aspects of the program.

June 1974 ● The Area Oil Shale Office was established within the Central Region of the Conservation Division, U.S.G.S., to administer the program and was staffed as a multidisciplinary organization.

May-August 1974 ● Exploration and environmental baseline data plans were received for the four prototype tracts.

- These plans were revised and approved with conditions by October 1974.

- Environmental baseline data collection commenced in the fall of 1974 and required two years worth of data was completed by the end of 1976.

December 23, 1975 ● TOSCO and ARCO withdrew as tract C-b lessees. Management felt that inflation, economics, and lack of government incentives made development of the lease unattractive. Shell and Ashland, the remaining lessees, continue work toward submittal of a Detailed Development Plan.

March-June 1976 ● Lessees submitted the required Detailed Development Plans as follows:

Tract	Date	Development Methods
C-a	March 1976	Open pit with indirect heated surface retorting.
C-b	Febr. 1976	Underground mining with indirect heated surface retorting.
Ua/Ub	June 1976	Underground mining with direct and indirect heated surface retorting.

- Over 200 copies of each of these plans and other reports under the program have been distributed to OSEAP, interested agencies, individuals, and libraries.

March-July 1976 • Lessees apply for a suspension of operations pursuant to Section 39 of the Mineral Leasing Act and the Oil Shale Lease.

- Tract C-b lessees applied on March 4, 1976.

- Tract C-a lessees applied on July 2, 1976.

- Lessees of Tracts U-a and U-b applied for a suspension on July 19, 1976. On September 27, 1976, the lessees withdrew their original suspension application and submitted a new application.

August-October 1976 • Suspensions of operations were granted for tracts C-a and C-b in August 1976 and for tracts U-a and U-b in October 1976 for the following reasons:

- All tracts: Data from the first year environmental baseline air quality program showed that natural background amounts on non-methane hydrocarbons, ozone and particulates on occasion exceeded National Ambient Air Quality Standards (NAAQS). EPA was consulted on this issue prior to granting the suspensions. During the period of suspension, EPA worked on this issue and further communication took place.

- Tract C-b: The on-tract drilling and rock mechanics program revealed that rock strength was considerably less than that assumed from mines on the basin margins, thereby decreasing the resource recovery by room and pillar methods to an unacceptable degree.

- Tract C-a: Open pit development of this tract was one of the methods for development envisioned in the environmental statement. The need for off-tract disposal sites was recognized in the statement and the Notice of Lease Sale. Subsequent to the sale, the Solicitor determined that the Department did not have authority to grant use of off-tract lands. Bills were introduced in Congress to authorize the use of off-tract lands.

November 2, 1976 • Shell Oil withdrew as a Tract C-b lessee and the remaining lessee, Ashland Oil, announced a partnership with Occidental Oil Shale on November 4, 1976, for the purpose of using Oxy's modified in situ technology to develop Tract C-b.

December 21, 1976 ● The Environmental Defense Fund, Colorado Open Space Council, Friends of the Earth, and Denver Audubon Society filed suit against the Department of Interior questioning the authority to grant the suspension of operations.

- This suit was dismissed based on the omission of indispensable parties and improper jurisdiction.

March 1, 1977 ● The Tract C-b lessee submitted a modification to their development plan, revising the method of shale oil production from room and pillar mining with surface retorting to modified in situ methods.

May 18, 1977 ● The lessees of Tract U-a and U-b filed suit against the Department of Interior seeking an injunction to indefinitely suspend the due diligence requirements, including bonus payments, of the lease until conflicts with regard to overlapping mining claims and state in lieu land selection of the leased areas were resolved.

- A hearing on a preliminary injunction was held on June 3, 1977, and continued to June 8, 1977, when the injunction was granted.

May 25, 1977 ● The Tract C-a lessees submitted a revision of their development plan revising the method of shale oil production from open pit mining with surface retorting to modified in situ methods, with surface retorting of development rock.

The C-a lessees also submitted an application to extend suspension of operations beyond the September 1, 1977, expiration date because the issue of baseline violation of National Ambient Air Quality Standards had not as yet been resolved.

- The transmittal letter offered to withdraw the application if the issue was resolved prior to September 1, 1977.

- The original suspension notice required lessees to file for an extension, if they wanted one, 90 days prior to termination. The lessees of tract C-b did not file by the cutoff date.

July 5, 1977 ● John A. Green, Regional Administrator for EPA Region VIII, sent the Area Oil Shale Supervisor a technical support document that provided the basis for an opinion by EPA that the presently measured air quality concentrations on the oil shale tracts do not preclude the development of the tracts' resources.

- EPA concluded that the air quality as represented by measurements on the Federal lease tracts does not preclude the development of the oil shale resource.

- This resolved the air quality issue which was no longer a valid issue for extending the suspension.

August 9, 1977 ● The Assistant Secretary - Energy and Minerals - was provided with the technical review documents and a draft approval letter for the C-b DDP prepared by the Area Oil Shale Office, and asked to concur in the Mining Supervisor's preliminary determination that the revised DDP be approved.

August 30, 1977 ● The Assistant Secretary - Energy and Minerals - concurred in the approval action and the approval letter for the modified DDP for modified in situ development of Tract C-b was formally signed by the Mining Supervisor and the lessees. The letter contained 12 specific conditions regarding environmental protection, monitoring, water management, abandonment, and submission of engineering plans for lease compliance evaluation prior to implementation.

September 1, 1977 ● The one year suspension of operations for both C-a and C-b were terminated and the request for an extension by C-a was denied.

September 22, 1977 ● The Assistant Secretary - Energy and Minerals - concurred in the approval action and the approval letter for the revised DDP for modified in situ development of Tract C-a was formally signed by the Mining Supervisor and the lessees. The letter contained 7 specific conditions regarding environmental monitoring, final design plans, shale disposal, emission modeling for commercial phase and submission of engineering plans for lease compliance prior to implementation.

December 6, 1977 ● The Environmental Defense Fund, the Colorado Open Space Council, and Friends of the Earth, Inc., filed suit in the United States District Court of Colorado seeking to enjoin any development of tracts C-a and C-b through declaratory judgment that NEPA requirements had been violated and that approval of the DDPs and related right-of-ways should be overturned until a site specific EIS is prepared and fully processed through NEPA procedures.

January 1978 ● American Mine Service Company, contract for Rio Blanco Oil Shale Company, started shaft sinking operations on Tract C-a. The 15-foot diameter shaft will be sunk to a depth of 950 feet and is expected to be completed by January 1979. This first shaft will be the Modular Development Phase service and production shaft. A ventilation shaft will be upreamed after completion of the service and production shaft.

February 1978 ● A contract was let to Gilbert Corporation, a subsidiary of Peter Kewitt and Sons, Inc., to sink four shafts on Tract C-b consisting of a 34-foot diameter service shaft, 29-foot diameter production shaft, a 15-foot diameter ventilation and escape shaft, and a 10-foot diameter temporary off-gas shaft. Shafts will be about 2,000 feet deept. The two larger shafts will be equipped with koepe hoists installed in 200 to 300-foot high concrete headframes and are believed to be the largest single service and production shafts in this country.

April 1978 ● Approval subject to audit was given to bonus offsets for Tracts C-a and C-b totaling more than required fourth bonus payments.

August 8, 1978 ● U. S. Court of Appeals ruled in favor of the State of Utah's claim to over 157,000 acres of in lieu land selections, including tracts U-a and U-b, in the Uinta Basin. On September 22, 1978, the Department of Interior filed a motion for rehearing before the Tenth Circuit Court. It is not known whether the issue will be heard by the U. S. Supreme Court.

August 25, 1978 ● Judge Finesilver, of the U. S. District Court, issued a summary judgment dismissing the December 6, 1977, suit filed by the Environmental Defense Fund, Colorado Open Space Council, and Friends of the Earth. The court held that the 1973 EIS for the prototype program was sufficient for DDP and right-of-way approvals, and further held that the procedures of the AOSO were more than adequate to fulfill the requirements of NEPA. This summary judgment has been appealed by the Plaintiffs.

CURRENT ACTIVITIES

Tract C-a

The Tract C-a lessees, Gulf Oil Corporation and Standard Oil Company (Indiana), have formed a general partnership under the name of Rio Blanco Oil Shale Company to develop the oil shale lease by a modified in situ technique.

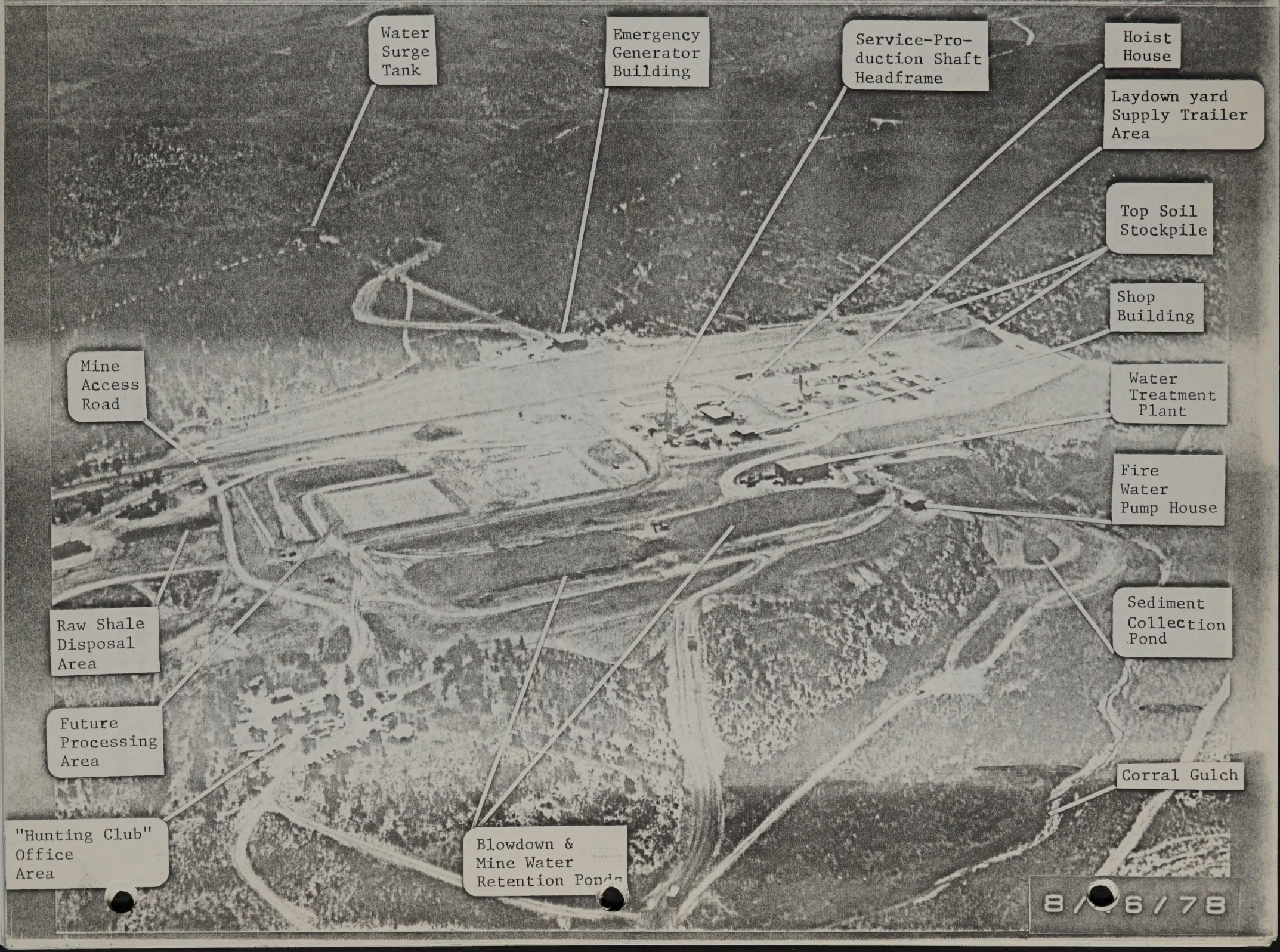
The 48-acre combined mine service and plant site area located in the north-central part of the lease tract is the site of construction of facilities for the Modular Development Phase of tract development. The hoist house and service and production shaft headframe are complete and being utilized to sink the first of two planned shafts. Sinking of the 15-foot diameter service production shaft has reached the "E level" (about 600 feet) with development of the shaft station at that level being started. A permanent pumping station is being installed in the "C level" (about 490 feet) to handle water inflow to the shaft. A ventilation shaft will be upreamed after the service production shaft is completed.

The dewatering/reinjection well system presently includes five dewatering wells which are piped to four reinjection wells. Temporary lines are being used to test other drill holes on the tract for reinjection potential.

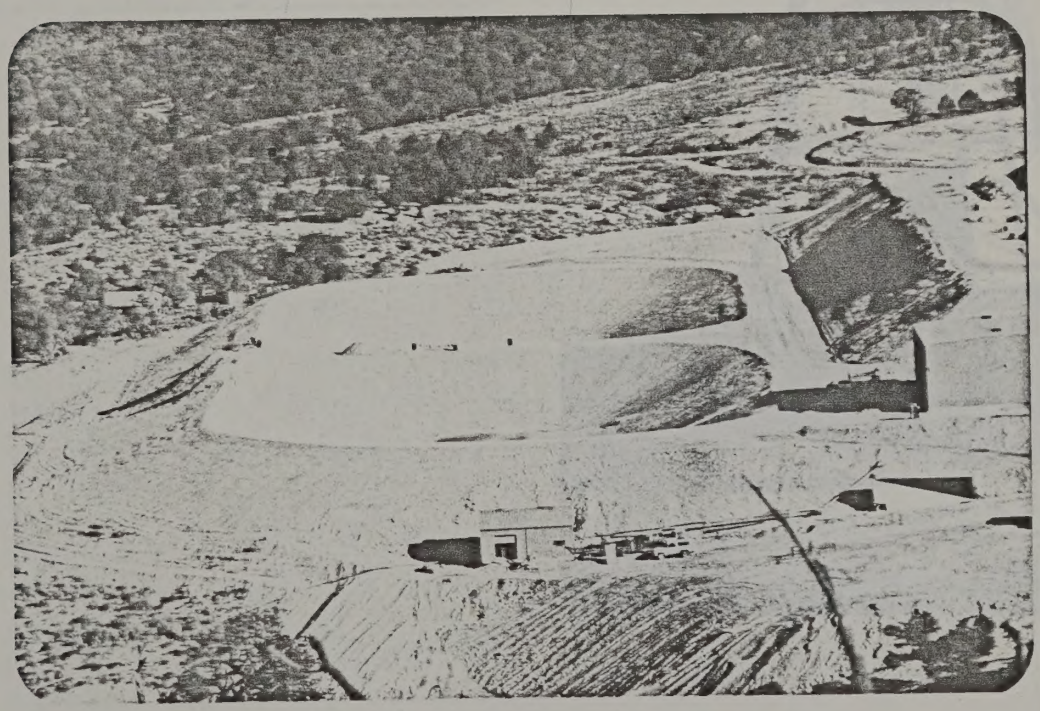
Buildings for administration services, mine rescue equipment, firewater pumps and emergency generators are under construction. The water treatment plant and maintenance shops are complete. Construction of the foundations for the processing equipment is underway.

The main access road and plant area have been gravel surfaced from the tract boundary to the construction area. A commercial powerline has been constructed to the tract. The permanent power distribution system is being placed underground in the plant area.

The workforce on Tract C-a is presently around 200 with a maximum of 300 projected for a four month period early in 1979.

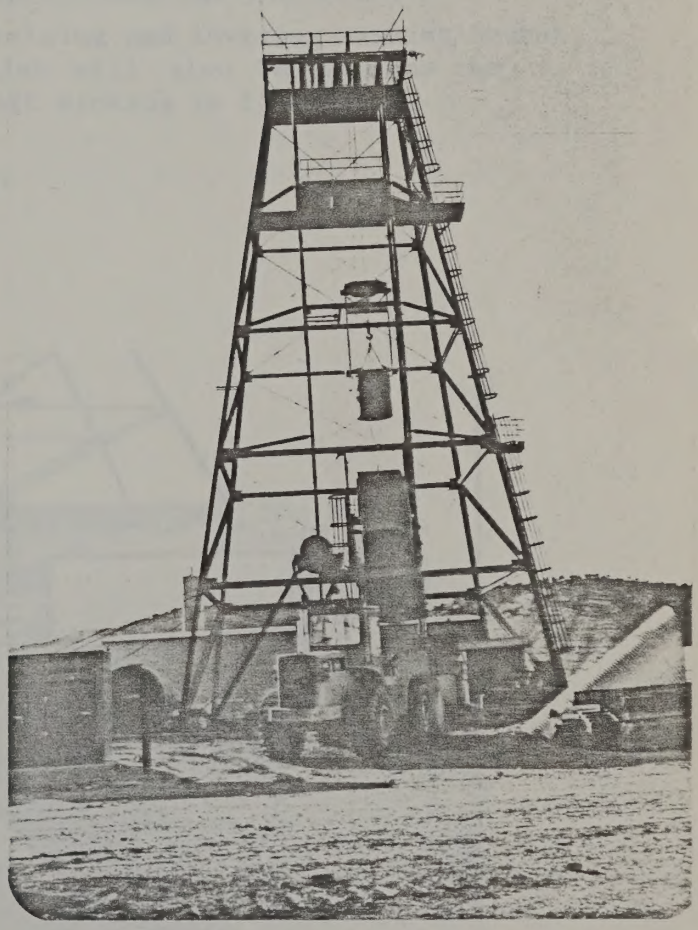

Water Surge Tank
Emergency Generator Building
Service-Production Shaft Headframe
Hoist House
Laydown yard Supply Trailer Area
Top Soil Stockpile
Shop Building
Mine Access Road
Water Treatment Plant
Fire Water Pump House
Raw Shale Disposal Area
Sediment Collection Pond
Future Processing Area
Corral Gulch
"Hunting Club" Office Area
Blowdown & Mine Water Retention Ponds
8/26/78

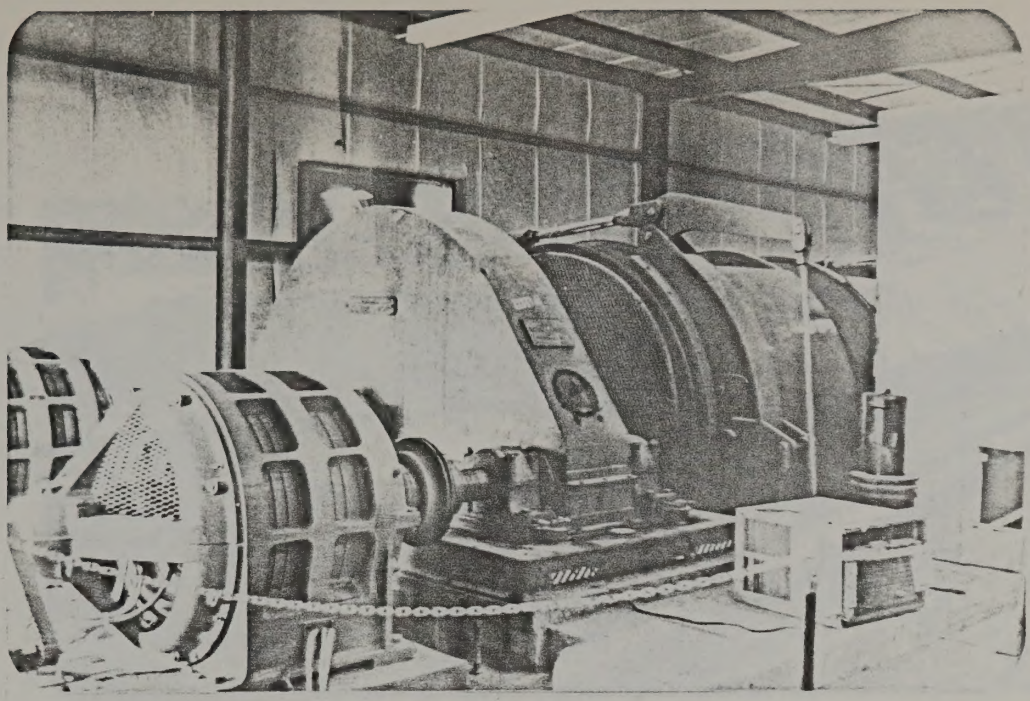
View to east across Mine Service Area of Tract C-a. Hoist House and headframe over 15-foot Service and Production Shaft in center. Lay-down yard, supply trailers, and concrete batch plant in foreground. Future construction of processing facilities in open area beyond shaft.



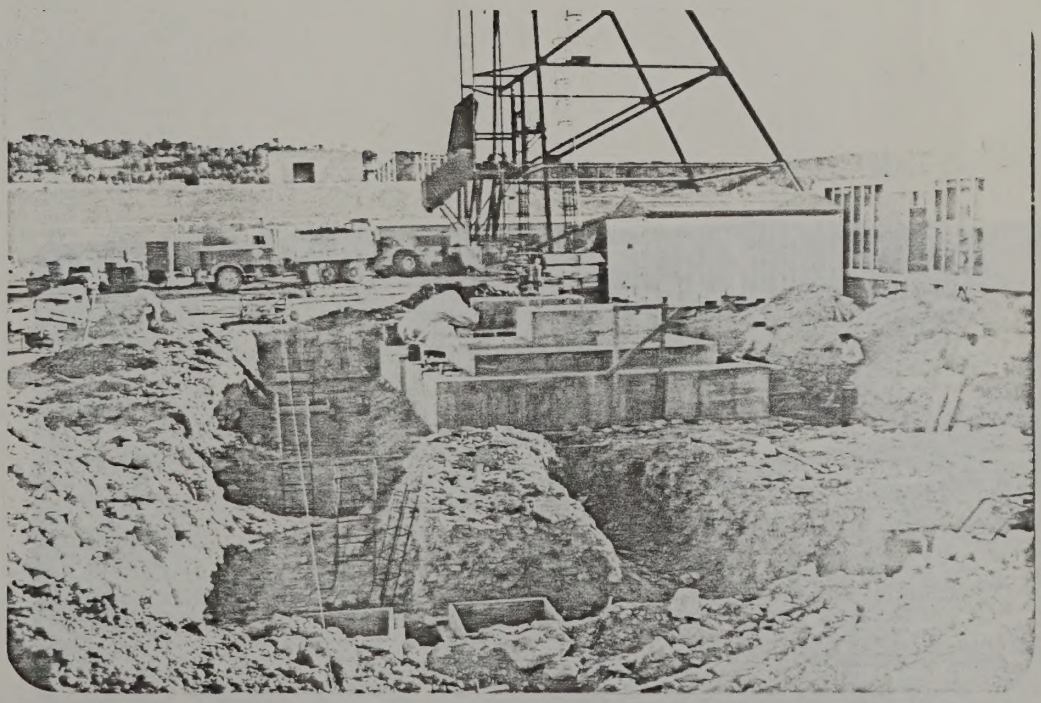
View to east across Mine Water and Blowdown retention ponds. Runoff water, shaft water, treated sewage effluent and processing blowdown waters are collected in ponds prior to being either reinjected or evaporated. Water treatment plant to right and fire water pump house in foreground.

Two views of headframe over Service and Production Shaft in Mine Service Area. This shaft is a 15-foot diameter concrete lined shaft with a final depth of 971 feet. Levels to develop the in situ retorts will be developed from this shaft.

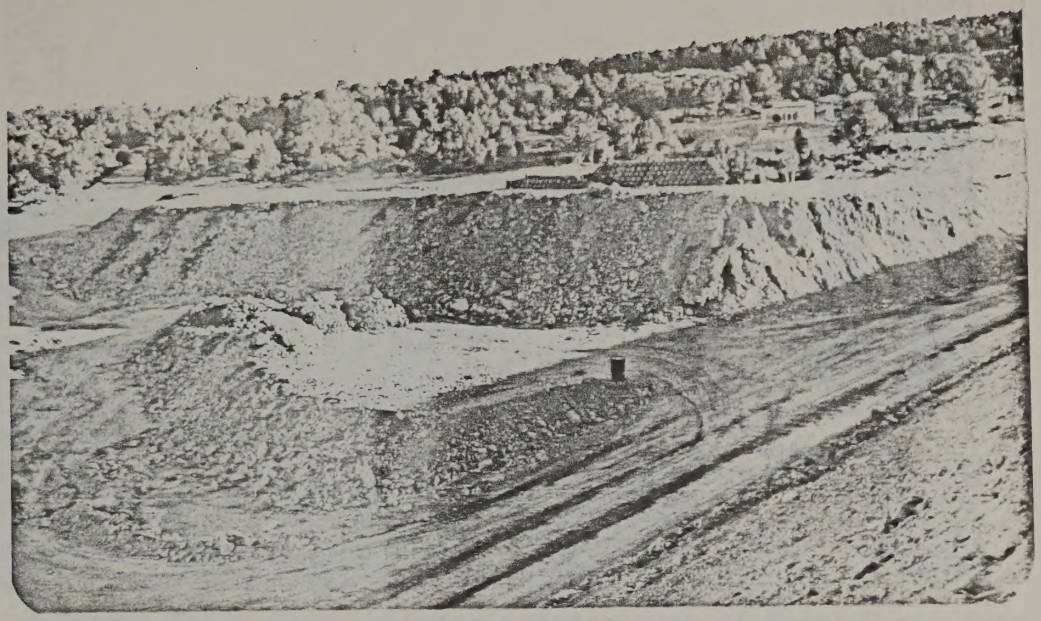




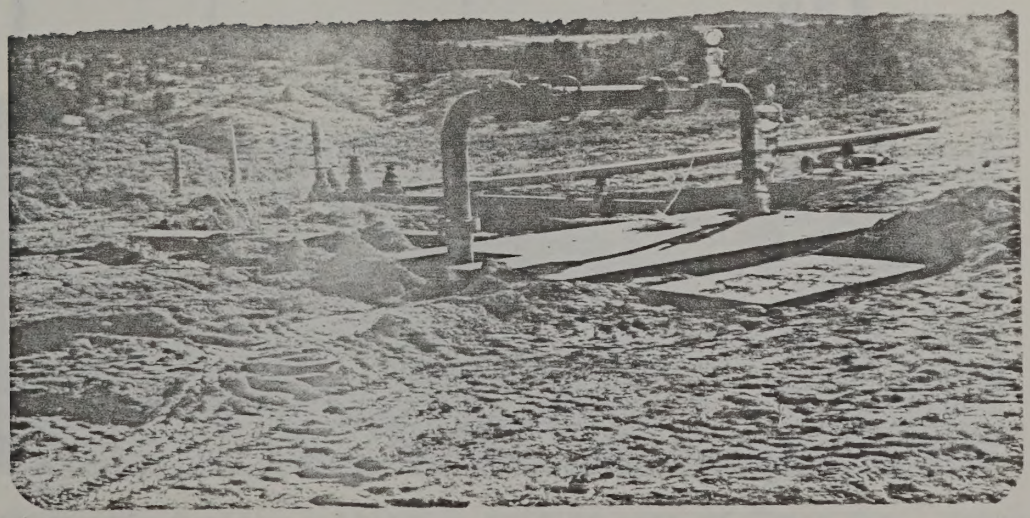
Main hoist located in Hoist House for raising and lowering sinking bucket during shaft sinking. These facilities will also be used as the permanent hoisting facilities after shaft sinking is finished.



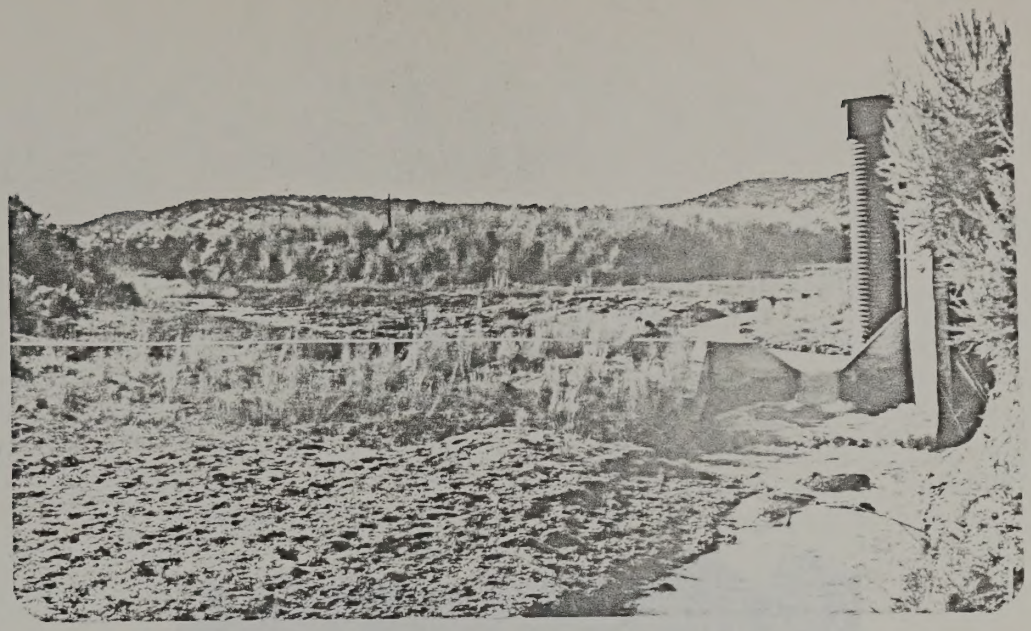
Foundation work for Compressor Building in Mine Service Area north of Service and Production Shaft. Emergency generator building in background.



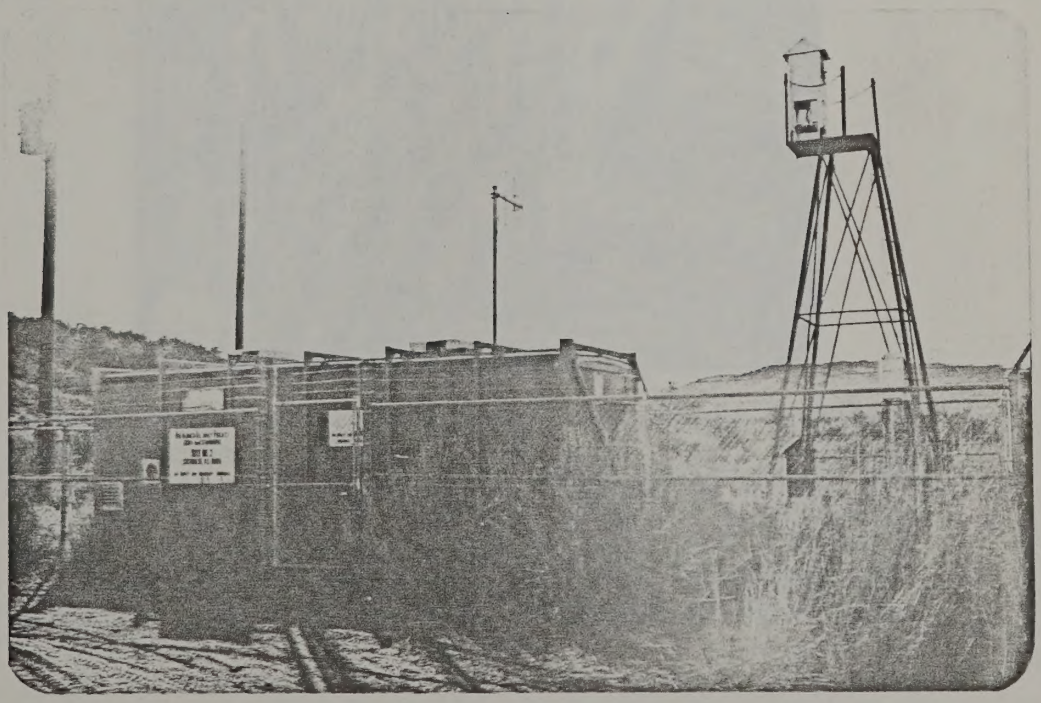
Initial raw shale disposal pile from shaft sinking operations. Shale from mine development during the Modular Development Phase (MDP) will be piled at this location just west of the Processing Area. The barrels on top of the pile contain raw shale samples to be sent to various research groups and laboratories for raw shale leachability, toxicity, etc., studies.



View of typical reinjection well installation. Foundation work almost complete for buildings to provide cold weather protection to well head equipment.



View of Corral Gulch water gauging station east of Tract C-a. Note "V" notch weir for measuring low flows. A concrete structure spans the entire drainage channel. Automatic equipment measures flow, temperature, conductivity, and suspended sediment load.



Meteorology - Air Quality collection trailer east of Tract C-a. Automation equipment measures temperature, wind speed and direction, humidity, sulfur dioxide concentration, nitrogen oxides, carbon monoxide, hydrogen sulfide and ozone. The instrument on the tower measures particulate concentration in the air.

View of revegetation study area. Tract C-a is presently monitoring revegetation success, plant vigor, and plant community composition on three revegetation sites. Two companion plots are on opposite north and south facing slopes. A third site was established with a layer of processed shale under a soil cover to determine the effect of potential leachate on revegetation success.

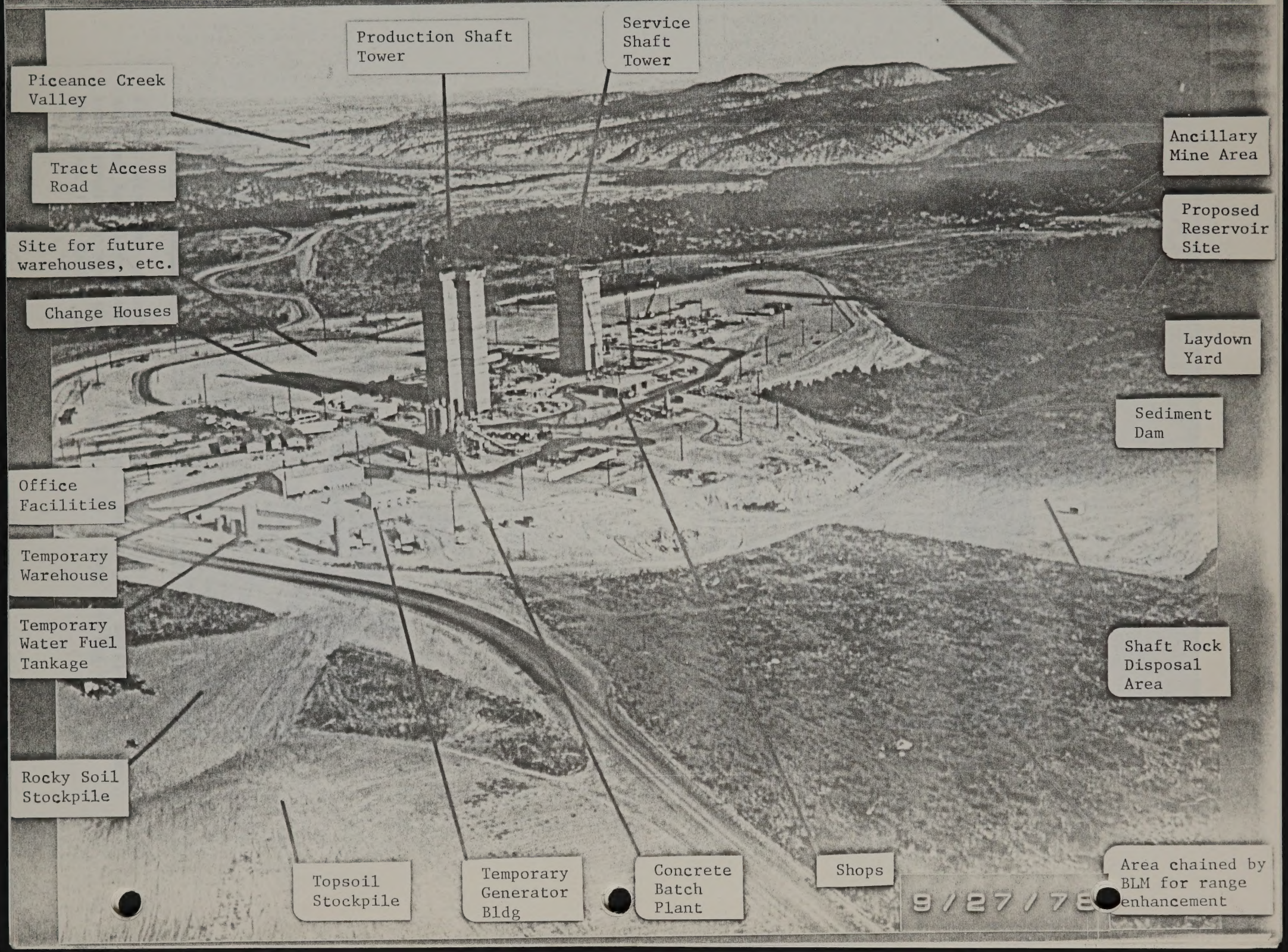
Tract C-b

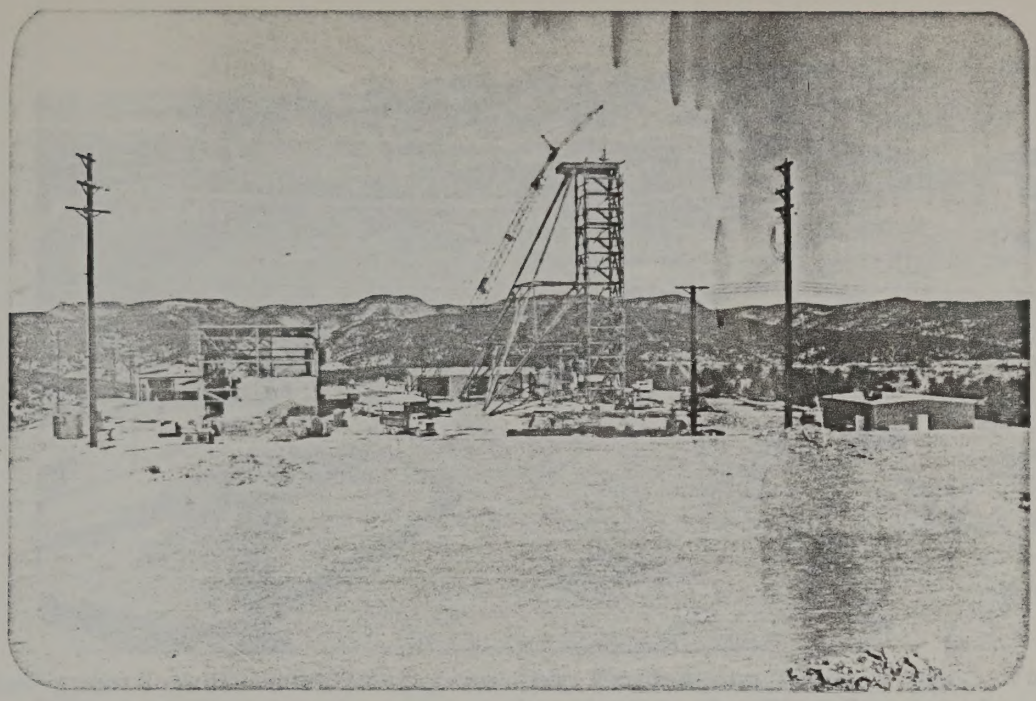
The Tract C-b lessees, Occidental Oil Shale, Inc. and Ashland Colorado, Inc., are actively developing the lease in support of future modified in situ operations on the tract.

An approximately 30-acre mine support area in the northwest portion of the tract has been brought to final grade and is now the site of intensive development of commercial sized shafts and related mine surface facilities. Slipformed concrete hoist towers have been completed for the 34-foot diameter service shaft (177 feet high) and for the 29-foot diameter production shaft (313 feet high). Sinking operations on both shafts progressed to the 84-foot level where sinking was temporarily halted while internal hoist towers and ground-mounted sinking hoists were being installed. Sinking operations are scheduled to restart in late December 1978. The 34-foot diameter air inlet tunnel to the service shaft has been completed. The production shaft will ultimately be equipped to hoist 66,000 tons per day. Within the mine support area, temporary administration buildings, a warehouse, generator sets, fuel and water tankage, powerlines, shops, compressor building, and a permanent concrete batch plant have been installed.

North of the mine support area, a 10-acre ancillary mine area has been brought to grade. Here work is well underway on a 15-foot diameter ventilation escape shaft and related hoist house, shops, and headframe. A 10-foot diameter retort off-gas shaft will be drilled in this area. Together, these shafts will access the initial modified in situ retorts.

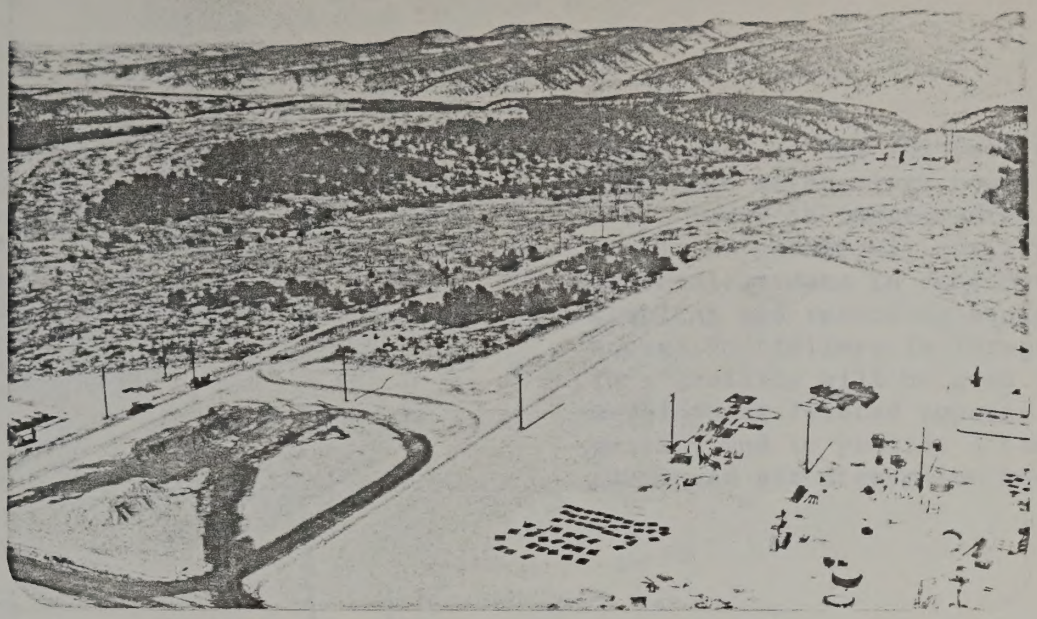
Both on-tract areas are accessible by a recently constructed all-weather, two-lane paved highway. Daily, nearly 300 workers are bussed to the site from nearby communities. Housing impacts have been mitigated by the lessee in these communities by the construction of front-end financed dwellings. This labor force will increase to about 400 persons during sinking of the three large diameter shafts.


Production Shaft Tower
Service Shaft Tower
Piceance Creek Valley
Tract Access Road
Site for future warehouses, etc.
Change Houses
Office Facilities
Temporary Warehouse
Temporary Water Fuel Tankage
Rocky Soil Stockpile
Topsoil Stockpile
Temporary Generator Bldg
Concrete Batch Plant
Shops
Ancillary Mine Area
Proposed Reservoir Site
Laydown Yard
Sediment Dam
Shaft Rock Disposal Area
Area chained by BLM for range enhancement
9/27/78

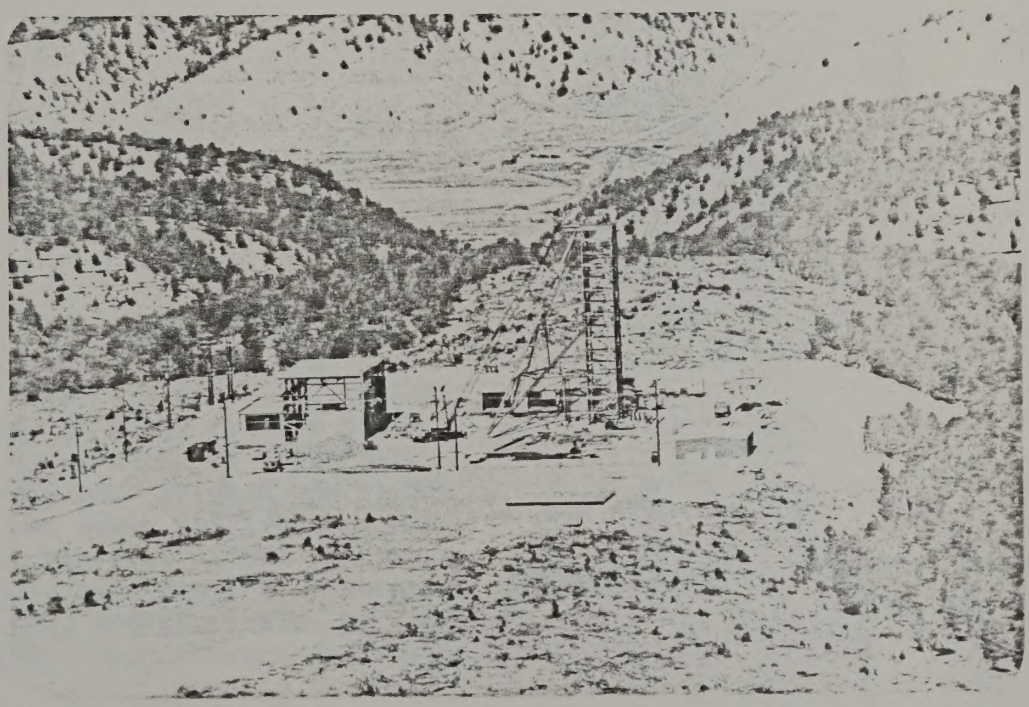


A closer view of the Ancillary Mine Area and shaft surface facilities is shown here. The facilities are nearing completion prior to commencement of sinking operations. Cleared area in foreground will be used for temporary retort off-gas processing, product storage, steam generation, and mine water treatment facilities.

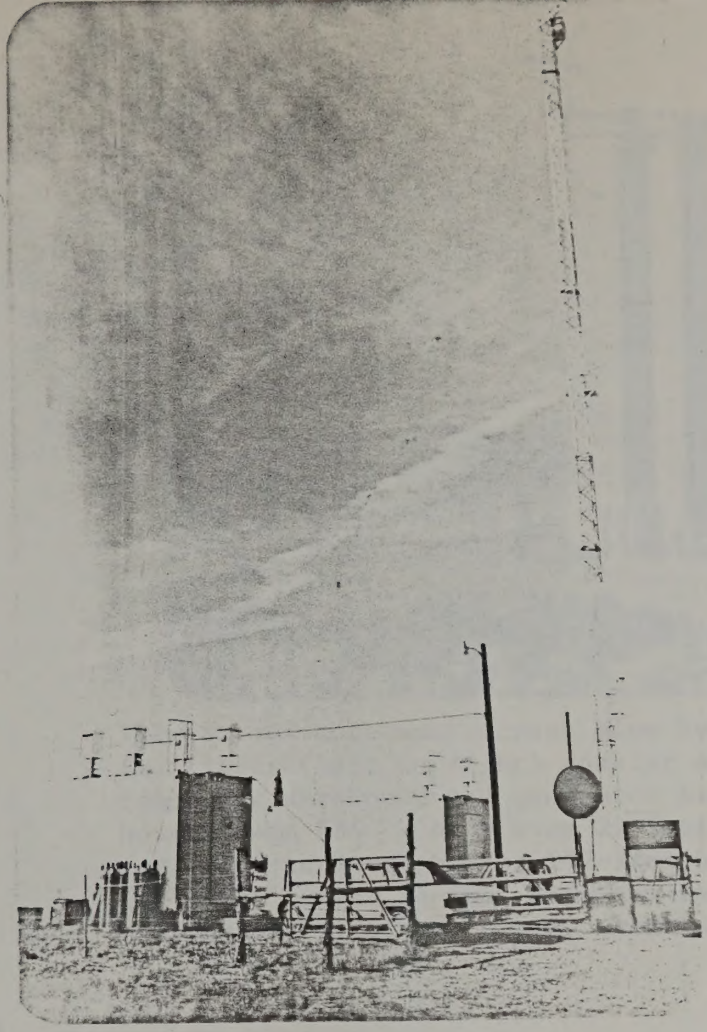
Buried telephone cable being installed along road between Mine Support Area and Ancillary Mine Area. Power will be provided initially by on-tract generator sets and later augmented by a line running south to the tract from Meeker, Colorado.



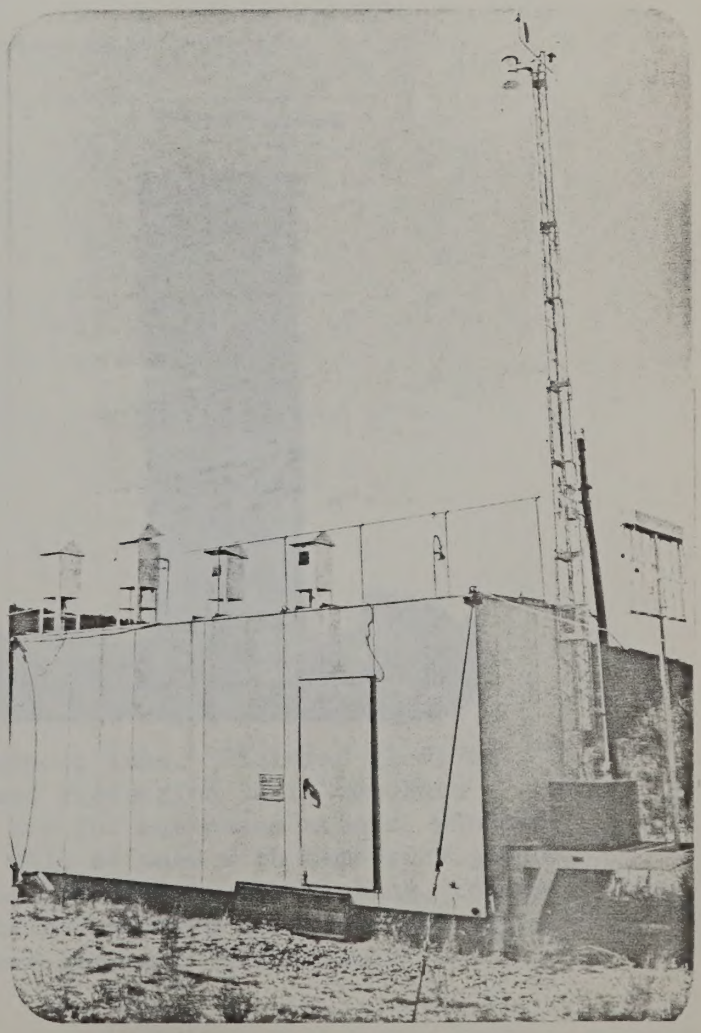
View toward north-northwest from atop Production Hoist Tower. Foreground is part of the laydown yard associated with the Mine Support Area. Ancillary Mine Area can be seen in upper right of photo. Ridge areas were chained by the BLM in the late 1960's (prior to leasing of the tract) to enhance range forage production.



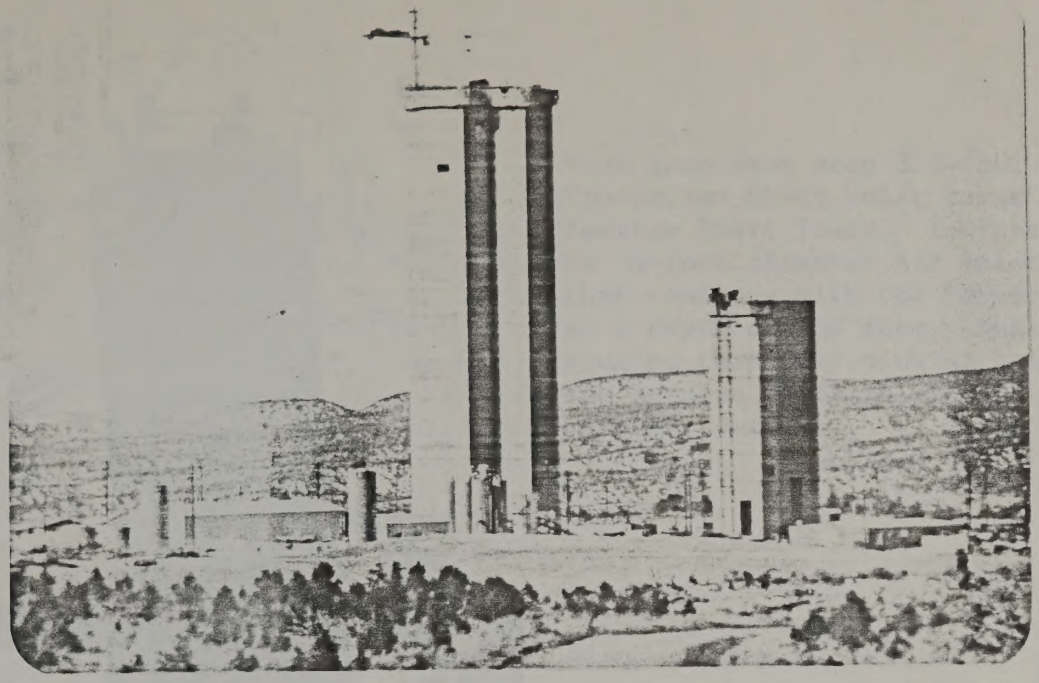
Looking north across Ancillary Mine Area. Pictured (left to right) are: hoist house; shop and compressor building; 15-foot diameter Ventilation/ Escape Shaft head frame; laydown yard; and dry storage building. The V/E shaft together with a 10-foot diameter retort off-gas shaft will be used to operate initial commercial size modified in situ retorts beneath Tract C-b. This facility will then be used for auxiliary ventilation and emergency escape. Piceance Creek Valley is visible in background.



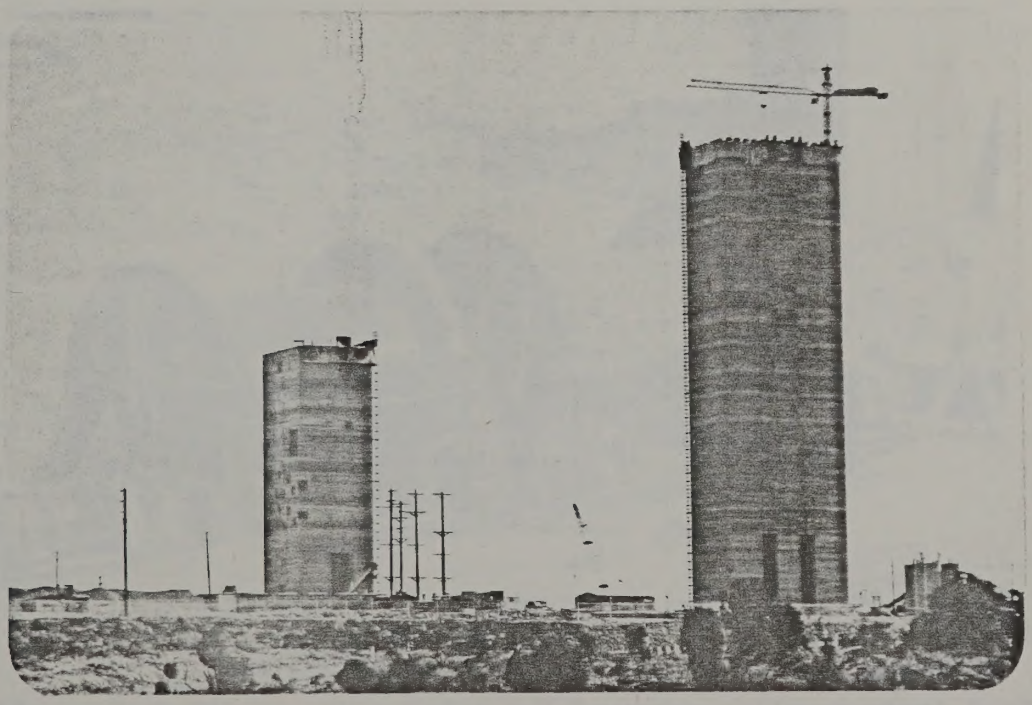
Shown here is the 200-foot (60 meter) high main meteorology tower on Tract C-b. Tower is instrumented at three levels to gather air quality/ meteorology data in conjunction with sampling and recording equipment housed in trailers in foreground. This facility will be used to monitor development related impacts on air quality and to provide a basis for continued air dispersion modeling.



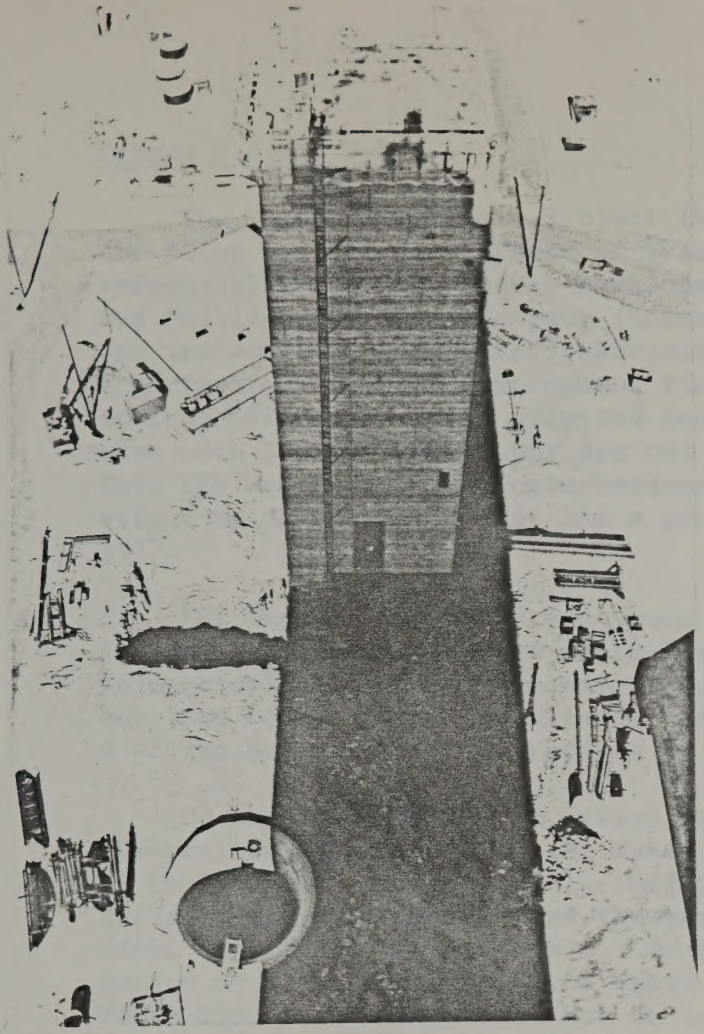
Pictured here is a small air quality/ meteorology sampling trailer along Piceance Creek north of Tract C-b. By comparing data between the valley site and the above on-tract station, local flow patterns within the tract airshed have been plotted, inversion layers noted, and dispersion patterns for emission from on-tract facilities modeled.



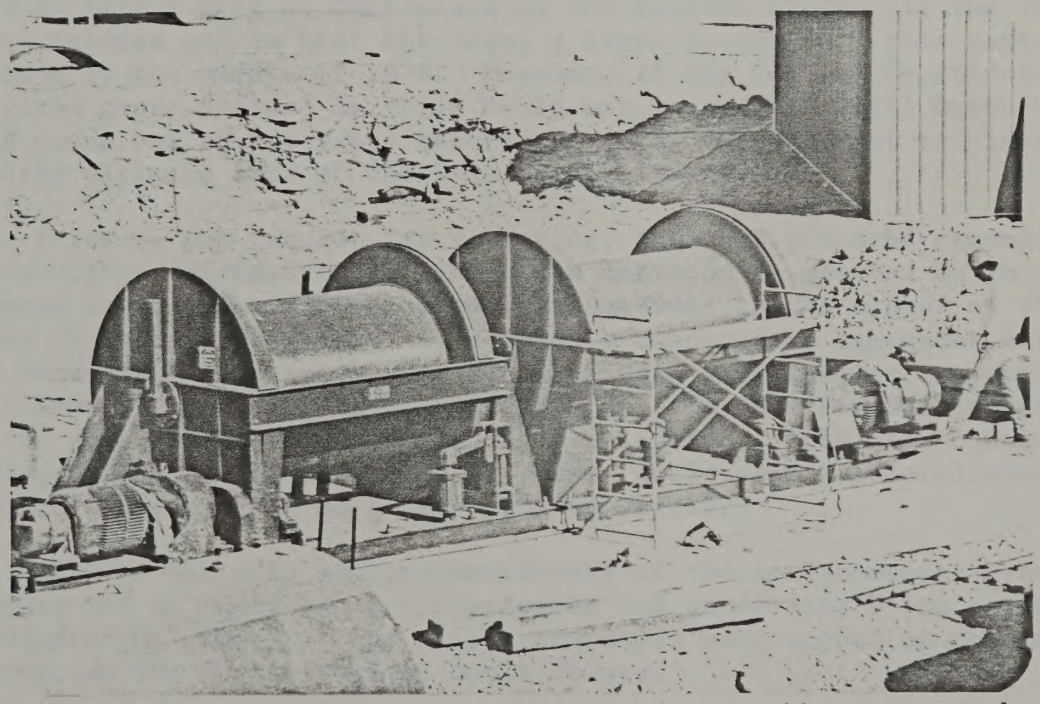
View toward northwest across Mine Support Area of Tract C-b. Mine facilities (left to right) consist of temporary water and fuel tanks; temporary warehouse and generator building; 313-foot high commercial hoist tower (84' x 46') over 29-foot diameter Production Shaft; silos for concrete batch plant; 177-foot high commercial hoist tower (55' x 45') over 34-foot diameter Service Shaft; and compressor and shop building for use during shaft sinking.



View toward the east across Mine Support Area. Pictured (left to right) are the commercial Service and Production Shaft concrete slipformed Hoist Towers. Openings are for equipment access, windows, and machinery ventilation. Towers will be used with temporary gound-mounted hoists to sink shafts. Contemporaneous with sinking, towers will be equipped with permanent internal mounted hoisting equipment, ore bins, ventilation stacks, and ore load-out facilities.



View seen from atop 313-foot high Production Shaft Hoist Tower toward Service Shaft Tower. In foreground is 34-foot diameter Air Inlet Tunnel that connects with the Service Shaft at a depth of 150 feet. Building housing temporary sinking hoists for the Service Shaft is visible to back left of tower.



Cable winders for use in raising and lowering galloway stage during sinking of 29-foot diameter Production Shaft. Much larger hoists will be used to raise and lower equipment and withdraw shaft muck rock during sinking.

Tracts U-a and U-b

The White River Shale Project (WRSP) was formed in 1974 to operate the joint venture development of Tracts U-a and U-b in Utah. WRSP is responsible to Sunoco Energy Development Company, Sohio Petroleum Company and Phillips Petroleum Company (lessees) for carrying out the planning and implementation of development activities. The Utah lessees submitted the required Detailed Development Plan (DDP) to the Area Oil Shale Supervisor in June 1976 outlining a proposed underground room-and-pillar oil shale mine with 100,000 barrel per day oil shale surface retorting facilities. This DDP was never acted upon because of a suspension of operations effective November 1, 1976, and a preliminary injunction effective May 31, 1977.

The Lessees completed two years of environmental baseline monitoring in January of 1977 and have since been involved in interim (suspension and injunction) environmental monitoring. This interim environmental monitoring has been conducted for compliance with the lease and to fulfill condition 4 of the Suspension of Operations.

On August 8, 1978, the United States Court of Appeals, Tenth Circuit (Denver) ruled in favor of the State of Utah's claim to over 157,000 acres of in lieu land selections, including tracts U-a and U-b, in the Uinta Basin. This opinion affirmed the earlier U. S. District Court (Salt Lake City) decision of June 8, 1976. On September 22, 1978, the DOI filed a Motion of Rehearing before the Tenth Circuit Court of Appeals. If the Tenth Circuit Court decides not to rehear the case, DOI would have 90 days to file a Writ of Certiorari to the Supreme Court. If the Supreme Court decides not to hear the case, a final decision in this matter could be made by the middle of 1979. However, if the Supreme Court decides to hear the case, a final decision would not be reached until October 1980. This means one to two years before the legal entanglement is cleared and the ultimate fate of the Utah leases is known.

Prior to the request for rehearing, the AOSS prepared recommendations and specific information to aid in the decision on whether to go to the Supreme Court. The AOSO gave two alternatives to the appeal of the U. S. Court of Appeals decision: 1) develop a cooperative agreement between the Department of Interior and State of Utah with respect to supervision of Tracts U-a and U-b and 2) selection of alternate Federal leases outside of the area of the State in lieu land selection. Both the cooperative agreement and alternative Federal leases would permit accomplishment of the prototype program goals as outlined earlier.

WRSP is not only keeping continuity of the environmental baseline studies but is researching technologies and performing Union retort studies in California. The parent companies have signed up for continuing support of the Paraho work at Anvil Points.

In Situ Leasing Program

Following the failure to lease two tracts in Wyoming which were thought to be suitable for in situ development, the Department of Interior reviewed the entire program and initiated an in situ leasing program. Tract nominations closed July 31, 1975, and a tract selection committee made recommendations on two prime and two alternate tracts in September 1975. The recommendations were submitted to OSEAP and the Panel's comments and recommendations were transmitted to the Assistant Secretary for Land and Water Resources. A decision was made to prepare a Supplementary Environmental Impact Statement covering the nominated tracts.

A task force, including five staff specialists of the AOSO, was formed in August 1976 to write the environmental statement. A preliminary draft was completed in March 1977, but questions were raised at the Departmental level regarding definition of the proposed action. Further work on the environmental statement was indefinitely suspended by the Assistant Secretary in December 1977. However, it was felt that the Department should preserve its future options under the prototype program and consider reoffering the two additional prototype tracts at an appropriate future time.

This program may again be initiated in the immediate future and will require the direct involvement of the AOSO. The program could include any of the tracts nominated to replace the Wyoming leases, but could also be expanded to include other alternative leases if the Utah tracts are ultimately controlled by the State of Utah. There is even some discussion of a leasing alternative to the proposed Superior oil shale land exchange. A Superior type of multi-mineral (oil shale, nahcolite, dawsonite) development would be a definite benefit to the prototype program. Several of the nominated in situ lease tracts could also be developed as multi-mineral projects.

WORK LOAD

Management Plan

To meet the management goal of the prototype program, it was recognized that a detailed management plan would have to be developed for the AOSO. In 1974, MITRE Corporation was awarded a contract for a management plan describing office accounting and recordkeeping procedures, interfaces with the lessees, outlines for data reports and DDP's, and formats for quarterly and annual reports. The final Management Plan was completed in September 1975 which set forth the objectives, tasks, procedures, and management structure for the AOSO. This plan has been used as a guide since then and will continue to serve the long-term goals of the program. Other specific plans have been developed by the AOSO for review and approval of DDPs and environmental monitoring programs, and will continue to be developed as needed in the future.

The Area Oil Shale Office is now in the process of developing a comprehensive management plan to guide in-house operations for the next five years. During this time, the lessees of the Colorado lease tracts will complete initial retort testing and construction of commercial size facilities. The management plan will establish procedures for all major lease administrative and development plan modification review functions. Procedures will be outlined for receipt, review, and final action on all future major lease required plans, reports, and other documentation requested by the Mining Supervisor; as well as transmittal of certain items to other governmental agencies and OSEAP when their input to the decision process is required. Planning documents that would fall within this management framework include: development plan modifications, monitoring plan revisions, changes to Lease Environmental Stipulations, engineering specifications, inspection and environmental monitoring reports, bonus credit requests and royalty production accounting, EA's and EIS's, and outside information requests, to mention only a few. The management plan will include a formalized procedure for tracking such documents through in-house review and for preparation of issue papers for major actions to assist and support the Mining Supervisor in reaching administratively sound decisions. The plan will also address use of project schedules and the Management by Objectives board to assist the Mining Supervisor in tracking management objectives, major development activities, and due diligence in development of the lease tracts.

This management plan will directly relate to budget programming and the projected work load for the Area Oil Shale Office during the next five years (FY 79 through FY 83). The next five years will be critical to the prototype oil shale program goals. The commercial feasibility of oil shale development may well be determined during this period. Table 1 presents actual and projected Work Load Statistics for areas of budget planning. Further discussion of these work load areas is presented in the following sections.

TABLE 1. WORK LOAD STATISTICS

	ACTUAL			PROJECTED				
	FY 1976	FY 1977	FY 1978	FY 1979	FY 1980	FY 1981	FY 1982	FY 1983
Plan Approvals and Modifications (250 hours/unit)	0	38	56	60	60	60	60	60
Inspections (32 hours/unit)	94	96	160	200	200	200	200	200
Field audits of environmental data collection (200 hours/unit)	5	7	12	25	30	30	30	30
Environmental program analysis (300 hours/unit)	10	10	15	25	30	30	30	30
Bonus and royalty accounting (40 hours/unit)	22	16	163	160	65	65	65	65
Environmental analysis (40 hours/unit)	3	3	2	2	2	2	2	2
Evaluation studies (2,000 hours/unit)	0	0	2	1	2	1	1	1
Meetings (4 hours/unit)	304	300	350	375	450	450	450	450
Public hearings (40 hours/unit)	15	18	9	0	2*	0	0	0
Positions	18	20	20	21	21	22	22	22
Budget (Dollars)	757,085	1,025,339	823,982	877,700	1,000,000	1,150,000	1,150,000	1,350,000

* Assumes submittal of a revised mining plan and public hearings for Utah leases, if they are retained in Federal ownership.

Manpower

The AOSO manpower has remained at the same level for the past two years; however, the Work Load Statistics chart shows a small increase through FY 83. This projected increase is due to the projected increase in inspections and plan modifications as more intensive development occurs on the Federal oil shale tracts. In evaluating the work load requirements of the AOSO; the prototype program goals, the unusual requirements of the oil shale lease and environmental stipulations, and the detailed review and approval process for plan submittals must be recognized. All of these areas result in management and operational problems unless a broad expertise of specialists is available.

The current level of manpower and actual positions are depicted in the AOSO Organizational Chart (Figure 1).

The Federal leases require the lessees to monitor each of the environmental areas before and during the development of the tracts. Furthermore, one of the Federal Prototype Oil Shale Leasing Program goals is: "To insure the environmental integrity of the affected areas and at the same time develop a full range of environmental safeguards and restoration techniques that will be incorporated into the planning of a mature oil shale industry, should one develop." To this end the AOSO was staffed with personnel with expertise in each of the environmental areas of concern outlined in the Federal Lease.

The Biological Sciences section includes two specialists (one oversees the wildlife concerns and the other handles reclamation) and a technician who assists the specialists and conducts many of the environmental inspections. The Atmospheric Sciences section also includes two specialists - one in Meteorology and the other in Air Quality. The Systems Analysis section is essential to perform the mission of the AOSO. MITRE Corporation, in it's Final Report, recommended automatic data processing as a means to greatly enhance the efficiency and effectiveness of the AOSO staff. The Hydrology and Processing sections of the AOSO organization currently consist of one specialist each. The Extraction or Mining section includes a supervisory mining engineer and a specialist who conducts many of the mining and construction inspections. The Geology section includes a geologist who oversees the geologic aspects of the prototype program and an environmental specialist who coordinates environmental activities. Three of the staff specialists have been designated as tract coordinators for the oil shale leases and are responsible for the general integration of the other staff specialists with respect to programs and plans on each lease. It must be noted that the Administrative Officer and Clerk work under the Regional Administrative Office of the Western Rocky Mountain Area; and provide assistance to the Area Mining Supervisor (Salt Lake City), District Geothermal Office (Salt Lake City), and District Mining Office (Rock Springs), as well as the AOSO.

The combined professional experience of the present staff represents over 200 man years.

Coordination

The prototype program requires a considerable amount of coordination time between the AOSO, lessees, BLM, OSEAP, other Federal, state and local agencies, and the public. Figure 2 illustrates some of the interfaces required in the prototype program. A significant portion of this coordination is through meetings, as indicated in the Work Load Statistics table.

These meetings include, but are not limited to:

- Monthly lessee coordination meetings.
- Quarterly monitoring program meetings.
- Other meetings with the lessees.
- OSEAP meetings (at least quarterly).
- Interagency meetings.
- Meetings with state and local governments, and private organizations.
- Monthly county Impact Mitigation Task Force meetings.
- Special technical and research seminars and workshops (Oil Shale Symposium, Environmental Oil Shale Workshop, etc.).
- Meetings sponsored by professional groups and organizations, but which deal with specific topics which have a direct bearing and application to oil shale development.

Before many of the development operations on the tracts can begin, 40 major Federal, state, and local permits will have to be obtained. This number does not include the innumerable building permits required for virtually every facility to be constructed on and off tract. In accord with the conditions for DDP approval, each permit application must be reviewed by the AOSO to insure consistency with the approved plans for tract development and compliance with lease terms. To assist permit review, a formalized evaluation procedure has been developed. Nevertheless, permit review requires a significant amount of staff time as well as operational meetings and other interface with the lessees and agencies of jurisdiction.

The Work Load Statistics project that the number of operational meetings will increase during the next five years, as development activities increase on the tracts. Most of this increase will be due to a greater need for increased coordination between the AOSO and the lessee with respect to development and environmental monitoring programs.

SOME AOSO INTERFACES

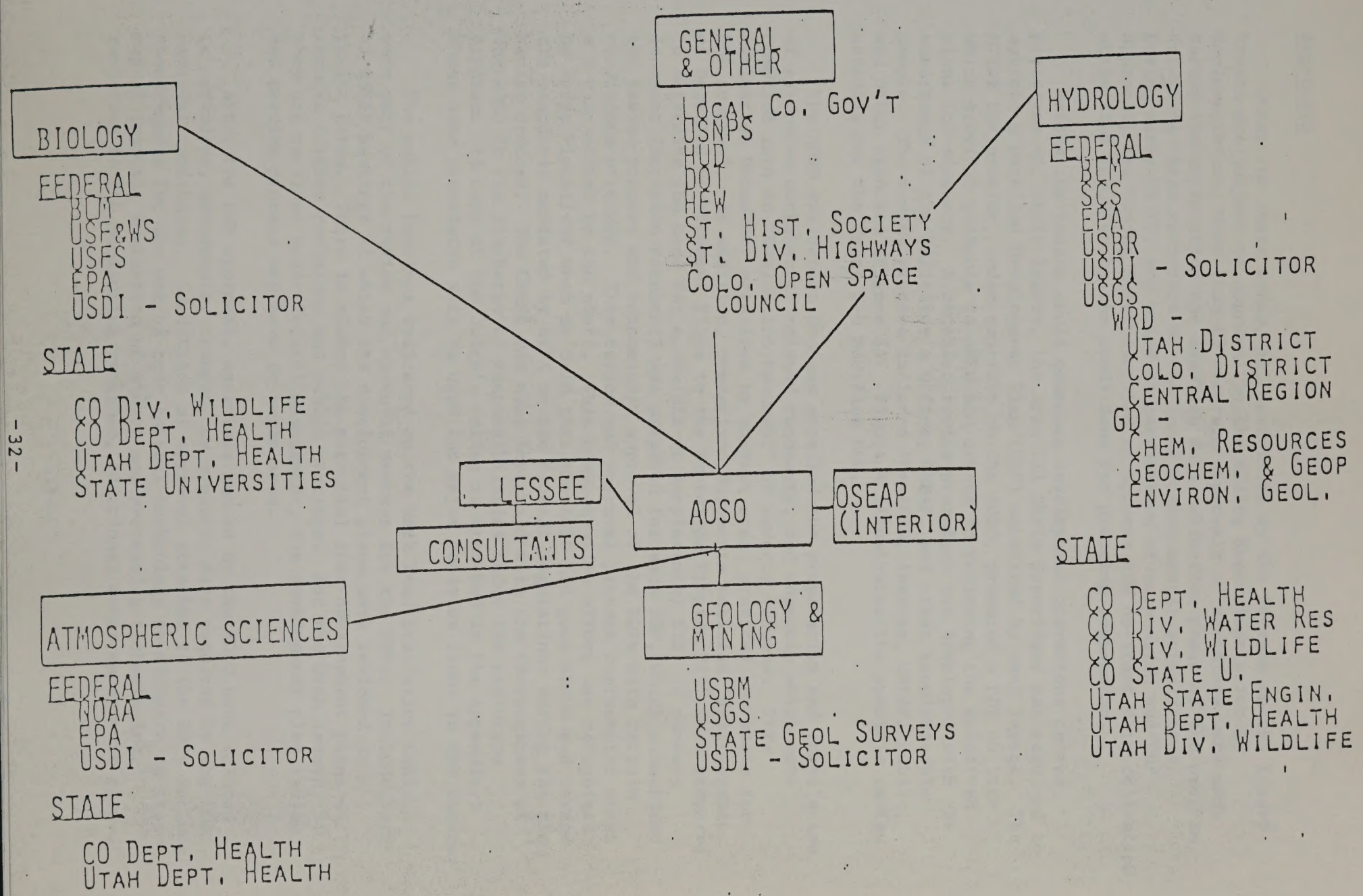


Figure 2

Approvals

Under the lease terms, all activities by the lessees on the leased tracts are subject to approval by the Mining Supervisor prior to implementation. More than 60 separate approvals or revisions were made during the exploration and baseline data collection phase of the program, including three revisions of the lease environmental stipulations. During early FY 77, and prior to termination of suspension and DDP approval, the Mining Supervisor had to approve the on-tract data collection activities required by the conditions for granting suspension.

Before the lessee could commence development operations on the prototype oil shale leases, the Area Oil Shale Supervisor was required to approve a Detailed Development Plan (DDP) submitted by each lessee. The MITRE Corporation, under contract to the AOSO, prepared a DDP outline which provided guidance to AOSO and others in reviewing the submitted plans for adequacy. A detailed review procedure was developed with the assistance of the Solicitor's Office, OSEAP, and other knowledgeable people. The review process included the AOSO, lessees, OSEAP, public, and other agencies (Figure 3). Figure 4 illustrates the specific review schedule for the Tract C-b Modified DDP.

The AOSO evaluation process entailed the preparation and compilation of extensive worksheets, related documents, and comments which were compiled into an "Evaluation Document" of several volumes. This Evaluation Document, organized by subject area, provided the basis for DDP approval. In addition, comparison documents entitled "Relationship of Detailed Development Plans to the Prototype Program EIS" were prepared to determine the need for a new EIS or supplemental EIS. A summary document (Decision Document) was prepared for each DDP, which summarized the review process and recommended approval of the DDPs with certain conditions attached. This review and approval process represented about a 1 year effort by the staff. This comprehensive effort was recognized by Judge Finesilver when he held that the AOSO had gone above and beyond the standards mandated by NEPA or the Federal Regulations during the plan review process. The Court was also impressed with the thoroughness of the AOSO in the discharge of responsibilities under the prototype program. (A copy of the Judge's ruling is attached in the Appendix.) These same procedures will be used for major decision items in the future.

The public hearings indicated on the Work Load Statistics table were part of the review and approval process for the DDPs. Included are 12 OSEAP meetings at which the development plans were reviewed in a public forum. There is always the potential that development plans will require further revisions and public hearings. For the Utah leases, if they are retained under Federal management, the development plan review and hearing process may have to begin anew.

After the DDP approval, approvals issued by the AOSO have related to additions, amendments, changes, or specific data required by the DDP approval conditions. Conditions of approval attached to the DDPs include requirements for the use of best control technology to mitigate environmental impacts, evaluation of mining and processing technologies, revisions to the monitoring programs, additional water management plans,

submittal of abandonment plans, and submittal of final design plans for all operations. The number of approvals, as indicated in the Work Load Statistics, can be expected to increase as additional required plans and information are submitted, and as unforeseen conditions and technology changes are encountered during development. The prototype program was based on the premise that changes would be made as knowledge is gained. The thoroughness, recognized by Judge Finesilver, involves a significant amount of time and will be continued during review of future changes and amendments.

Inspections

The primary purpose of oil shale lease inspecitons is to insure compliance with the terms of the Federal oil shale lease and environmental stipulations, and compliance with the plan outlined in the approved DDPs. The oil shale lease requires specific requirements for environmental monitoring, access and service, fire prevention and control, fish and wildlife management, health and safety, historic and scientific value protection, oil and hazardous materials, air pollution, water pollution, noise control, rehabilitation, aesthetics, vegetation, and waste disposal. Additional requirements in the operational field include protection and conservation of the resource, due diligence inspections, documentation of bonus offset expenditures, and validation of data collection programs. To insure these requirements are met, the AOSO consists of a multi-disciplinary staff of professionals including mining engineers, chemical and petroleum engineers, geologists, wildlife specialists, reclamation specialists, biologist, hydrologist, and meteorologists. Oil shale lease inspections are performed by each of these specialists in their specific discipline areas. This is a tremendous task and requires coordination and supervision to solve problems as they arise in this extremely environmental-conscious prototype oil shale program.

The increase in number of inspections from 1976 to 1978 (Work Load Statistics) reflects the actual increase in rate and complexity of tract development activities. The number of inspections can be expected to continue to increase over the next five years as actual mining and retort development are initiated. These next few years of development and evaluation will be critical to the determination of commercial feasibility. Thus, operations through the initial retort tests will be evaluated by in-depth inspections in the operational and environmental areas.

Environmental Monitoring

One of the goals of the prototype program is to provide advice to the Secretary of the Interior on environmental effects of future oil shale leasing. Each lessee conducted one of the most comprehensive environmental baseline data collection and exploration programs associated with any mineral development. The environmental assessment activities included evaluation of surface and subsurface hydrology, air quality and meteorology, plant and animal life, soil productivity, and archaeology. Each lessee spent between five and seven million dollars on these two-year programs required by the oil shale lease. During 1977, each lessee submitted a final environmental baseline report which presented an analysis and summary of the two years' data. This data will be used to determine the conditions existing prior to oil shale development on the leased lands.

After the lessees have compiled comprehensive baseline data on all environmental parameters in their leased area, they are required to conduct monitoring programs before, during, and subsequent to development operations and to continue these until the Area Oil Shale Supervisor is satisified that all Federal, state, and local environmental requirements have been met. These development monitoring programs are currently being implemented by the oil shale lessees.

The complexity, variability, and extensiveness of the proposed development monitoring plans prepared by the lessees posed a serious review problem for the AOSO. In order to permit review by the AOSO staff specialists in an orderly and systematic manner, work began on a set of "Guidelines". These "Guidelines" were intended to assure a thorough review of the lessees' monitoring plans and that all important aspects were covered. The development of the monitoring guidelines and implementation of the monitoring programs by the lessees has taken about two years of effort. Parameters to be considered in developing a monitoring program for specific mining operations include cost effectiveness, available environmental technology, statistical validity, and data presentation and analysis. An excellent reference describing a systematic approach to planning and conducting a comprehensive monitoring program is "A Systems Approach to Ecological Baseline Studies", FWS/OBS-78/21, by Ecology Consultants, Inc., and funded by the U. S. Fish and Wildlife Service, March 1978.

All disciplines in the AOSO have participated in the plan review process to ensure a complete and thorough monitoring program. These specialists will continue to be involved in monitoring plan changes, inspections of the program, and analysis of data. It is anticipated that a contract will be issued in the future to design an environmental data base management system for the prototype oil shale program. This system would allow the storage, recall, analysis, and report preparation necessary to rapidly assess the environmental costs of oil shale development and to evaluate mitigative efforts.

The Work Load Statistics table indicates three major areas of increased work load with respect to environmental programs over the next five years. These areas are plan approvals and modifications,

field audits, and program analysis. Because of the nature of the prototype program, the environmental monitoring plans can be expected to be modified as development progresses. Field audits of the methods and techniques used in the monitoring programs are conducted to assure that the data collected is statistically sound. Program analysis includes interpretation of data and recommendations for program changes.

Bonus Offsets and Royalty Accounting

Under the prototype program, the lessees of the two Colorado tracts submitted bonus bids totaling $328,083,600 to the Federal government for the right to develop oil shale beneath the tracts. These bonus bids are paid in five equal yearly payments with the right to deduct (bonus offset credit) certain development related costs from the last two payments. In June 1975 (Federal Register Vol. 40, No. 125), the Department of Interior issued "Guidelines for Credits Against Fourth and Fifth Bonus Installments Under the Prototype Oil Shale Leases". The AOSO subsequently prepared bonus offset credit evaluation procedures to be used in the review of these bonus offset requests, which involve significant sums of money.

As of the end of October 1978, the Tract C-a lessees had offset the 4th installment (due March 1, 1978) in the amount of $10,354,153.02 approved and $44,395,041.00 subject to payback agreements. These amounts exceed the 4th installment by $12,688,074.02, which will be applied toward the 5th installment (due March 1, 1979). A total of $4,608,249.93 was disapproved. The 5th installment totals include $1,407,930.18 approved and $318,344.74 subject to payback agreements, with $2,733.75 disapproved.

The Tract C-b lessees have offset the 4th installment (due April 1, 1978) in the amount of $6,782,062.70 approved and $18,802,226.39 subject to payback agreements. These amounts exceed the 4th installment by $2,026,689.01, which will be applied toward the 5th installment (due April 1, 1979). A total of $2,988,400.60 has been disapproved. To date, no applications toward the 5th installment have been received.

These above approvals are subject to audit investigations. Payback agreements are continually reviewed to insure that the expenditures for certain items are being used in development of the lease tracts. The initial credit evaluations and subsequent audits and reviews will require a significant number of man hours during the next five years. This effort is indicated in the Work Load Statistics table. Issue-decision papers will be prepared for specific bonus credit applications that involve critical issues. An example of such a bonus credit was an issue-decision paper prepared regarding socioeconomic expenditures.

Royalty accounting procedures will also have to be developed prior to production from the first test retorts. Section 7 of the Oil Shale Lease describes the methods for determining royalties and provides for offset of royalties by certain development related costs. Specific procedures will have to be developed by the AOSO with respect to these royalty provisions, and will involve some manpower time. These procedures developed will be formalized in a document that will specifically describe the royalty accounting methods acceptable to the AOSO.

Contracts

The AOSO has provided funds for a number of contracts in support of the prototype program. Contract assistance for specific projects will continue to be used as needed and will require some coordination from the AOSO technical staff. Following is a brief description of the contracts which have been fully or partially funded by this office:

1) MITRE Corporation - developed a detailed Management Plan for the conduct of the prototype program. The two major tasks included an outline of a DDP; and a plan setting forth the objectives, tasks, procedures, and management structure for the AOSO. ($120,667.25)

2) Golder Associates - add on to a USBM contract for a study of water management aspects of oil shale mining and retorting. The AOSO funding was for evaluation of true and modified in-situ mining and retorting systems. ($30,000.00)

3) State of Colorado - grant money was issued through the State to the U. S. Census Bureau to conduct a special census of the three county oil shale impact area (Mesa, Garfield, Rio Blanco counties). Current census data was critically needed to establish population figures for baseline data and planning in order to assist in mitigation of socioeconomic impacts ($63,570.00)

4) Colorado State University - a study to evaluate which plant species are best adapted for revegetating soils disturbed by oil shale development. ($8,980.00)

5) Fish and Wildlife Service - development of a rapid access plant information network (PIN) as a management tool for planning reclamation projects. System will also be used to inventory vegetation communities and prepare environmental assessments or impact statements. ($23,000.00)

6) Donaldson Computing and Software - definition of a scope of work and preliminary systems design for the AOSO environmental monitoring data systems. ($2,500.00)

7) U.S.G.S., Geologic Division - trace element analysis of oil shale core from Tract C-a. This is a comparative sample evaluation to verify and confirm the trace element analyses of Core Laboratories, Inc. ($3,780.00)

8) General Services Administration - a thorough analysis of document handling systems for the AOSO. This task is being funded by the USGS, Office of Assistant Division Chief for Programs, Applied Research and Analysis Section. ($10,036.40)

Outside Studies

The technical staff of the AOSO have participated in a large number of outside studies and projects. The involvement in these program and non-program related studies not only recognizes the professional experience of the AOSO staff specialists, but also requires a considerable amount of time. Most of these tasks are not evident on the Work Load Statistics table. It is expected that, because of the expertise of the AOSO staff and the broad nature of the oil shale program, participation in outside studies will continue. The staff of the AOSO have also prepared several professional articles, assisted in the editing of others, and periodically present oil shale related speeches or lectures.

Following is a list of the studies and projects in which the AOSO has and is involved:

- Piceance Basin Habitat Management plan (BLM)
- White River Management Framework Plan (BLM)
- Piceance Basin Ground Water Advisory Committee
- Yellow Jacket Multiple Objective Planning Team (Bureau of Reclamation)
- USF&WS/OBS Biological Modeling Program
- In-situ Oil Shale Leasing EIS
- Colony EIS and land exchange mineral evaluation (mineral evaluations are identified in the Work Load Statistics table)
- Superior EIS and land exchange mineral evaluation (see above)
- Central and Southern Utah Regional Coal EIS
- Powder River Basin Regional Coal EIS
- EPA Quality Assurance Program
- Upper Colorado River Resource Study Planning Team
- Oil and gas environmental analyses (these environmental analyses are identified in the Work Load Statistics table)
- Assisted in preparation and review of oil shale related EARs by BLM
- Review of Potash EAR
- Review potash reserves and calculations for Carlsbad nuclear waste disposal proposal
- Review of contract for potash mine abandonment
- National Research Council, Committee on Surface Mining and Reclamation, Panel on Oil Shale and Tar Sands
- Research proposals and work by EPA, DOE, Bureau of Mines, U. S. Fish and Wildlife Service, etc.